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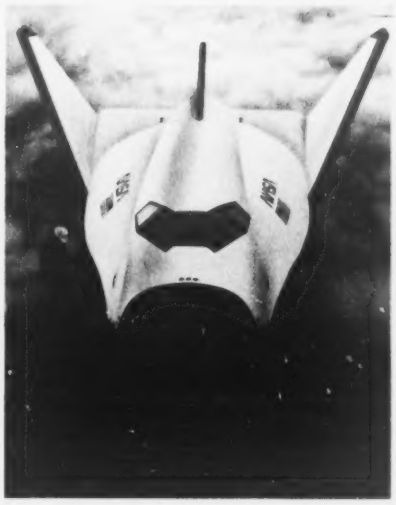

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R&D

The International Magazine of Research and Development

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ABOUT THE COVER Emission control is improving, thanks in part to better modeling. The inset photo is from Pacific Northwest Laboratory. *See article, page 24.*

R&D FOCUS

Making Air Pollution Models Fit Closer 24

Improvements in air monitoring and data processing capabilities are increasing the reliability of emission predictions.

Asea Brown Boveri—A Model For Global Management 30

R&D Magazine's top corporation has internal contradictions. It's global yet local, centralized yet decentralized. That's why it works.

Corporation of the Year, page 30

SPECIAL SECTION

Salute to French Technology II 43

In France, it's 'haute-tech.' Elf's R&D goes beyond oil. Europe's HDTV is on its way. It's all in the packaging. High-speed plane requires global alliance. R&D yields concrete results. Sun, sea, sand—and science. If it paints your nails, lifts your rocket, it could be SNPE's.

French Technology II, page 43

PRODUCT APPLICATIONS

STM Reveals Structure Of Fullerene Films 38

Using an STM in high vacuum, researchers analyzed the growth characteristics of C_{60} and C_{70} films.

R&D BUSINESS

Japanese Companies Return Total R&D Growth to Double-Digit Figures

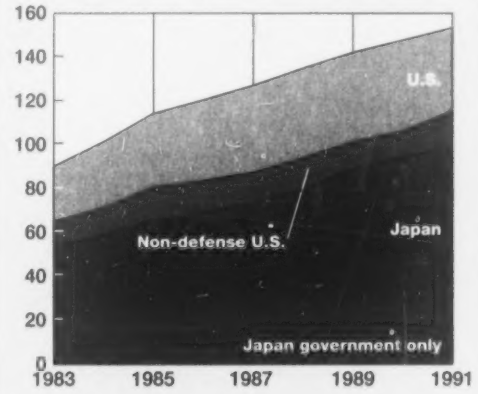
The latest figures for industrial and governmental Japanese R&D reveal a growth rate of 11.2% for FY1989, the first time growth exceeded 10% since 1985, according to data released by the Japanese Management & Coordination Agency (MCA), Tokyo.

This growth rate should remain at this level over the next few years, according to a study of the MCA report by the Japan Economic Institute (JEI), Washington, DC. Current R&D proposals for Japan's governmental FY1992 R&D budget, which traditionally go through only minor modifications, request a 6.4% increase for the Science and Technology Agency to $4.1 billion and a 3.4% increase for the Ministry of International Trade and Industry (MITI) to $2 billion. These increases equal or exceed the FY1989 increases.

The Japanese government's share of total R&D has continued its decade-long drop to only 18.6% of total funding in 1989, from 20% in 1988.

Governmental R&D has seen only modest changes over the past decade (high of 8% in 1987). The double-digit growth rates are primarily a function of rapid industrial R&D growth, which is forecast to experience continued increases. The JEI study also revealed a Japanese corporate trend to concentrate more of its R&D on development and applied research and less on basic research.

The FY1992 budget proposals reveal double-digit growth requests for research in space technology (10% increase for development of the Japanese module for the U.S. space station), human genome (67% increase partially for a computer link to Johns Hopkins Univ., Baltimore), and global environment (22% increase mostly for MITI's Research Institute of Innovative Technology for the Earth, set to open in 1992). □



***Combined industrial** and government R&D spending in Japan and the U.S. has been growing at $5 billion to $6 billion/yr over the past six years.*

Engineering Status—Shortage or Not?

Demographic studies over the past five years revealed fewer students going into engineering and increasing numbers of senior engineers retiring. This led the National Research Council (NRC), Washington, DC, to predict an engineering shortage in the U.S. by the end of the 1990s. However, new data reflecting slow economic growth, defense budget cutbacks, and increased offshore sourcing of R&D, lower the outlook for engineering demand, according to Alan Fechter, executive director of the Office of Scientific and Engineering Personnel at the NRC.

"There's no strong sense of crisis at the present time," says Fechter. However, he does express concern about the disappointed people who went into engineering expecting a shortage, only to graduate and find that there were no jobs available. □

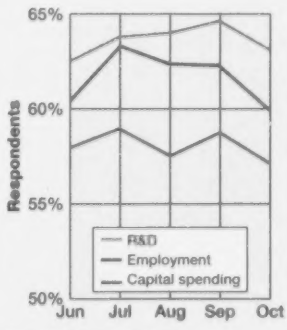
Cautious Growth In Electronic R&D

Uncertainty in the electronics industry led companies to cut back on their R&D spending in 1990, according to a recent study by *Electronic Business* magazine. Overall R&D spending by

Replacement Drives AA Growth

The market for atomic absorption (AA) spectrophotometers, a mature technology dependent on replacement sales, will grow 5% annually to $296 million in 1995, according to Strategic Directions Intl., a Los Angeles-based consulting firm.

AA instruments are used to identify trace elements in the parts per billion range. Graphite furnace AA instruments are used to monitor metals in environmental samples.



R&D Confidence Dips

Corporate executives have lost a little confidence in their ability to maintain R&D efforts, according to a survey by Cahners Economics, Newton, MA.

In October, only 62.9% of the 400 companies interviewed in CE's monthly survey said that their R&D, employment, and capital investment would remain stable or increase over the next few months.

R&D BUSINESS

the top 100 U.S. companies grew by only 5.3%, the third consecutive drop from the industry's growth peak of 22.9% in 1987.

R&D spending of the top 100 companies as a percent of sales and as a percent of net profits, while still positive, both dropped from the record high levels posted in 1989.

Lower R&D spending growth reflected the lower sales, profits, and market expectations of the electronics industry over the past three years, according to John Gawalt, a science resource analyst at the National Science Foundation, Washington, DC.

R&D growth is not expected to return to the high levels experienced in 1987 and 1988 in the near future. However, Cahners Economics forecasts a healthy sales upturn in early 1992, but notes that a cautious attitude still pervades the industry. □

Top 10 Electronics R&D Spenders

	R&D as % sales	1990 R&D spending*
1 Cypress Semicond.	24.7%	$56
2 Integrated Device	19.9	42
3 Advanced Micro	19.2	204
4 Cadence Design	18.4	43
5 Ashton-Tate	17.2	40
6 Mentor Graphics	17.1	74
7 Applied Materials	17.1	97
8 Analog Devices	16.6	80
9 VLSI Technology	16.5	54
10 Cray Research	16.0	128

* millions Source: Electronic Business

R&D spending increases averaged 14.9% in 1990 for the top electronic firms. The industry average of 5.3% was down from 1989's 10.6% average increases.

Economic Outlook At An Economic Price

Cahners Economics is making available its *1992 Economic Outlook* that includes macroeconomy forecasts, demographic and regional trends, and projections for more than 40 manufacturing, construction, and service sectors.

For a copy, send a check for $21 (normally $75) to cover postage and handling to: Cahners Economics, PO Box 59, New Town Branch, Boston, MA 02289. □

Baldrige Awards Go To Smaller Firms

The winners of this year's Malcolm Baldrige Quality Award have several things in common: they all were started less than 20 years ago, they all are involved in the manufacture of electronic equipment, and they all are considerably smaller than the corporate giants, such as IBM, General Motors, and Westinghouse, who won the award in the past.

The 1991 awards, managed by the National Institute of Standards and Technology, Gaithersburg, MD, were given to Solectron, San Jose, CA, Zytec, Eden Prairie, MN, and Marlow Industries, Dallas. The largest of these (Solectron) has $265 million in sales; while Zytec has $50 million and Marlow $12 million in sales.

The awards program, established by Federal legislation in 1987, has been criticized in the past for a policy of self-nomination, implying that large companies had an advantage over smaller companies because of the amount of time and money that they could put into an entry. Critics have also charged that the awards program lacks a clear definition of what quality is and how it can be judged. R&D

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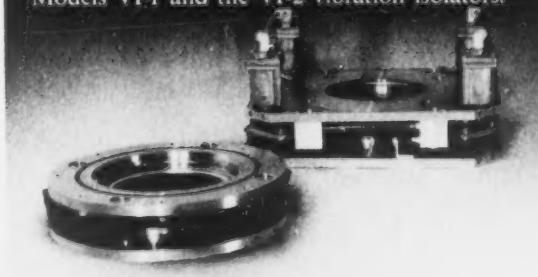

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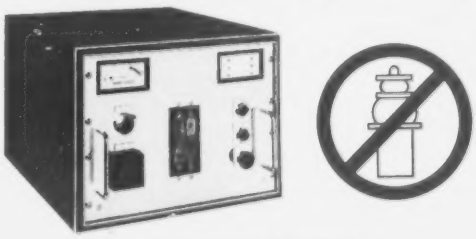

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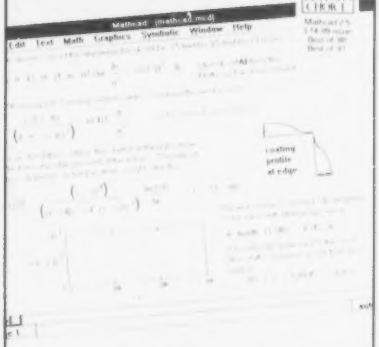

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†Foreign

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